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PROJECT CHECO SOUTHEAST ASIA REPORT

BUFFALO HUNTER (U)

1970 - 1972

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PROJECT CHECO
Contemporary
Historical
Examination of
Current
Operations
REPORT

BUFFALO HUNTER (U)

1970 - 1972

24 JULY 1973

HQ PACAF

Directorate of Operations Analysis

CHECO/CORONA HARVEST DIVISION

Prepared by:
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Project CHECO 7th AF (CDC)

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14. ABSTRACT

Project CHECO was established in 1962 to document and analyze air operations in Southeast Asia. Over the years the meaning of the acronym changed several times to reflect the escalation of operations: Current Historical Evaluation of Counterinsurgency Operations, Contemporary Historical Evaluation of Combat Operations and Contemporary Historical Examination of Current Operations. Project CHECO and other U. S. Air Force Historical study programs provided the Air Force with timely and lasting corporate insights into operational, conceptual and doctrinal lessons from the war in SEA.

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DEPARTMENT OF THE AIR FORCE
HEADQUARTERS PACIFIC AIR FORCES
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PROJECT CHECO REPORTS

The counterinsurgency and unconventional warfare environment of Southeast Asia has resulted in USAF airpower being employed to meet a multitude of requirements. These varied applications have involved the full spectrum of USAF aerospace vehicles, support equipment, and manpower. As a result, operational data and experiences have accumulated which should be collected, documented, and analyzed for current and future impact upon USAF policies, concepts, and doctrine.

Fortunately, the value of collecting and documenting our SEA experiences was recognized at an early date. In 1962, Hq USAF directed CINCPACAF to establish an activity which would provide timely and analytical studies of USAF combat operations in SEA and would be primarily responsive to Air Staff requirements and direction.

Project CHECO, an acronym for Contemporary Historical Examination of Current Operations, was established to meet the Air Staff directive. Managed by Hq PACAF, with elements in Southeast Asia, Project CHECO provides a scholarly "on-going" historical examination, documentation, and reporting on USAF policies, concepts, and doctrine in PACOM. This CHECO report is part of the overall documentation and examination which is being accomplished. It is an authentic source for an assessment of the effectiveness of USAF airpower in PACOM when used in proper context. The reader must view the study in relation to the events and circumstances at the time of its preparation--recognizing that it was prepared on a contemporary basis which restricted perspective and that the author's research was limited to records available within his local headquarters area.

Robert E. Hiller

ROBERT E. HILLER
Director of Operations Analysis
DCS/Operations

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FOREWORD

Aerial photographic reconnaissance was a vital part of the U.S. intelligence effort during the Vietnam conflict. In addition to their more routine daily intelligence product, reconnaissance photographs occasionally disclosed extraordinarily significant information on increased enemy capabilities. For example, aerial photography provided the 9 January 1967 issue of Aviation Week and Space Technology with the first U.S. photograph of the Soviet ATOL heat-seeking air-to-air missile, the missile being under the wing of a MIG-21 aircraft airborne over North Vietnam. Subsequently, another photograph of a surface-to-air missile (SAM) site in North Vietnam revealed a man in a mysterious white cubicle atop a Fansong radar van. From that picture, U.S. intelligence personnel deduced that the North Vietnamese possessed an optical tracking capability for their SAMs.[1] Both of these photographs provided the Southeast Asia (SEA) air commanders with invaluable intelligence concerning the air defense capabilities of North Vietnam at times when U.S. aircraft were vulnerable to those defenses. Responsible for these notable discoveries as well as for many thousands of additional feet of significant reconnaissance photography was a drone aircraft which had been gathering intelligence information over SEA, and especially over North Vietnam, since 1964.[2] At that time, these reconnaissance operations functioned under tight security; and to maintain that security, the reconnaissance directors changed the nickname of the operation several times--BLUE SPRING, BUMBLE BUG, BUMPY ACTION, and finally BUFFALO HUNTER in February 1970.[3] By the BUFFALO HUNTER era, however, the

drone's use was no longer a tightly-held secret. Howard Silber in an Omaha World-Herald editorial said that the "Buffalo Hunter can spot a water buffalo standing belly-deep in the muck of a rice paddy."[4] Although water buffaloes were hardly the reconnaissance targets for the drones, Silber's wry assessment of their capability is an accurate one.

This report examines the entire BUFFALO HUNTER operation--management, targeting, drone capabilities, mission planning and execution, and operational results--as it supported the Commander, Military Assistance Command, Vietnam (COMUSMACV) and his deputy for airpower, the Commander of Seventh Air Force (7AF). The report discusses only drone photographic reconnaissance although the same basic drone has been used as an electronic intelligence platform and as a leaflet dispenser in operations COMPASS COOKIE and FIELD GOAL, respectively. In fact, some sources imply that electronic intelligence and leaflet missions were embodied in the BUFFALO HUNTER program. Granted, the same drone platform controlled by the same Strategic Air Command (SAC) aircrews conducted electronic intelligence and leaflet missions, but SAC Operations Order 63-70-1 detailing the BUFFALO HUNTER mission addresses only photographic operations.

It is appropriate that the story of the reconnaissance drone be told at a time when the effectiveness of the North Vietnamese air defenses has demonstrated the need in modern aerial warfare for "stand-off" delivery systems--for remotely piloted vehicles--of all types. As a possible forerunner of such systems, the drone had flown hundreds of missions over hostile areas and the operation had never lost a crew member.[5] The

BUFFALO HUNTER is a combat-tested, unmanned system which has functioned effectively in a combat environment.

Low Altitude BUFFALO HUNTER Drone

FRONTISPIECE

CHAPTER I

THE BUFFALO HUNTER SYSTEM

To fulfill his photo intelligence needs, the Commander of 7AF drew upon three different reconnaissance systems--his own RF-4C* tactical reconnaissance (TAC Recce), SAC's SR-71 GIANT SCALE,** and SAC's BUFFALO HUNTER drone reconnaissance.*** [6] The drone system consisted of four major elements: a DC-130 mother ship for drone launch and control, the drone, a ground control station for drone recovery control, and a CH-3 recovery helicopter for drone retrieval. Of these, the drone was the heart, giving the system the unique capabilities that made drone photo reconnaissance an invaluable asset to the SEA military intelligence community.

The Drones

While a novel innovation at first, drones came into general use in SEA. At first, because of the highly surreptitious nature of the original drone operations, the drones were code designated SPAs, for Special Purpose Aircraft. By the beginning of BUFFALO HUNTER, however, the drones had been operating in SEA for over five years and their use was commonplace. The North Vietnamese were undoubtedly familiar with the dwarf aircraft

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*RF-101s also performed TAC Recce in the 1960s.

**SAC's U-2 GIANT NAIL operations were almost exclusively responsive to the Commander-in-Chief, Pacific Command (CINCPAC). Furthermore, the SAM and MIG threats precluded the U-2's use over North Vietnam.[7]

***For cost effectiveness comparisons between tactical reconnaissance and BUFFALO HUNTER drone reconnaissance, see "Cost Effectiveness of BUFFALO HUNTER Compared to Tactical Reconnaissance," PACAF/DOAR Briefing Notes, December 1971. For a more recent discussion, see "BUFFALO HUNTER Effectiveness Update," PACAF/DOAR Briefing Notes, January 1973.

that regularly buzzed their cities, airfields, rail lines, bridges, roads, and waterways. (Indeed, they even had one. Imagery from a 3 December 1969 BUMPY ACTION mission over North Vietnam showed a reconnaissance drone sitting intact on Phuc Yen Airfield.) Further, some Air Force officers speculated that North Vietnamese gunners used U.S. drone sorties for target practice and that MIG pilots used them to practice intercepts.[8]

That the enemy should use the SPA for target practice was fitting since the drone was originally developed principally to serve as a target in the evaluation of U.S. weapon systems employing surface-to-air and air-to-air missiles. Although modified with cameras and more powerful engines for their reconnaissance mission, the BUFFALO HUNTER drones were basically the same BQM-34A "Firebee" target drone which Ryan (later Teledyne Ryan) Aeronautical Corporation developed for the Air Force at the close of the 1950s.[9] Following the Cuban missile crisis, the Air Force started a modification program, whereby the target drone could provide a reconnaissance overflight capability without human risk and attendant political involvement such as had occurred in 1960 when a U-2 piloted by Francis Gary Powers was shot down over the Soviet Union and again in 1962 when Air Force Major Rudolph Anderson's U-2 was shot down over Cuba.[10]

The Model 147 drones used for BUFFALO HUNTER operations had evolved through several developmental model series. The primary vehicle was the Model 147SC low altitude drone, designed for use in the altitude range of 500 to 1,500 feet. Designated the AQM-34L by the Air Force, it was approximately 29 feet long, had a 13-foot wing span, and weighed 3,067 pounds

when loaded with fuel and camera. Its power plant was a Continental J-69 turbojet weighing less than 360 pounds but capable of developing 1,920 pounds of thrust. The drone's nominal speed for its low altitude mission was 500 to 540 knots, but it could reach 590 knots on the deck and had a maximum range of about 650 nautical miles (NM). The camera was a Fairchild 415Y, still picture, rotary prism, moving film, panoramic type, designed specifically for the low drone. It provided 180 degrees of lateral coverage transverse to the flight path, i.e., horizon-to-horizon, when the drone flew straight and level. Carrying 1,800 feet of 70 millimeter film at 1,500 feet altitude, the camera was capable of 120 NM of continuous longitudinal (along-track) photographic coverage with 60 percent frame overlap. The usable lateral coverage (swath width) was 3 NM from 1,500 feet and one to two nautical miles from 500 feet. The nadir resolution of the three-inch focal length camera was an optimum six inches at 1,500 feet, one foot at 1,000 feet. The maximum altitude for usable photography with this camera was 3,750 feet.[11] The photograph of a B-52 crash site in North Vietnam shown in Figure 1 is a particularly good example of the drone's low-altitude photographic capability--the people inspecting the debris are easily distinguishable.

Although they were used infrequently, the Models 147H and 147T provided the high-altitude drone photo reconnaissance capability. Designed to operate at 60,000 to 70,000 feet, they were 30 feet long with a 32-foot wing span and weighed 3,716 pounds when loaded. The newer drones of the 147T series were powered by Continental J-100 turbojet engines developing 2,700 pounds

of thrust. The camera was a Hycon Model HR-338A frame type with a 24-inch focal length. Mounted in an oblique head lens cone, it swept an arc across the line of flight. With 1,500 feet of film at 70,000 feet, a typical mission obtained approximately 820 NM of along-track photography within a total powered flight of 1,830 NM. The ground resolution was three to six feet at the nadir.[12]

The BUFFALO HUNTER drones had self-contained guidance systems consisting of a programmer compass, Doppler equipment, and an autopilot. Before each mission, operators programmed each drone's system to guide the drone from its launch point along a preplanned track over the reconnaissance targets, then to a recovery area. The accuracy of the guidance system in the high drones was not as critical as for the low drones because of the high drones' large area coverage. For the low drone, with its narrow swath width and its frequent proximity to rugged terrain, navigational accuracy was of the utmost importance. The navigation system in the Model 147SC was subject to error of about 3 percent of the distance traveled by the drone.* For example, after 100 NM of flight with the navigation system working properly, the drone would be within about 3 NM of a planned target. Since the swath width for usable photography from 500 feet required the low drone to be within about one half to one mile of the target, the internal navigational accuracy was not satisfactory by itself. The remedy, although not a complete solution, was the Microwave Command Guidance System (MCGS)

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*The accuracy figure is circular error probable, i.e., the drone would be within the 3 percent radius of a target on 50 percent of the trials.

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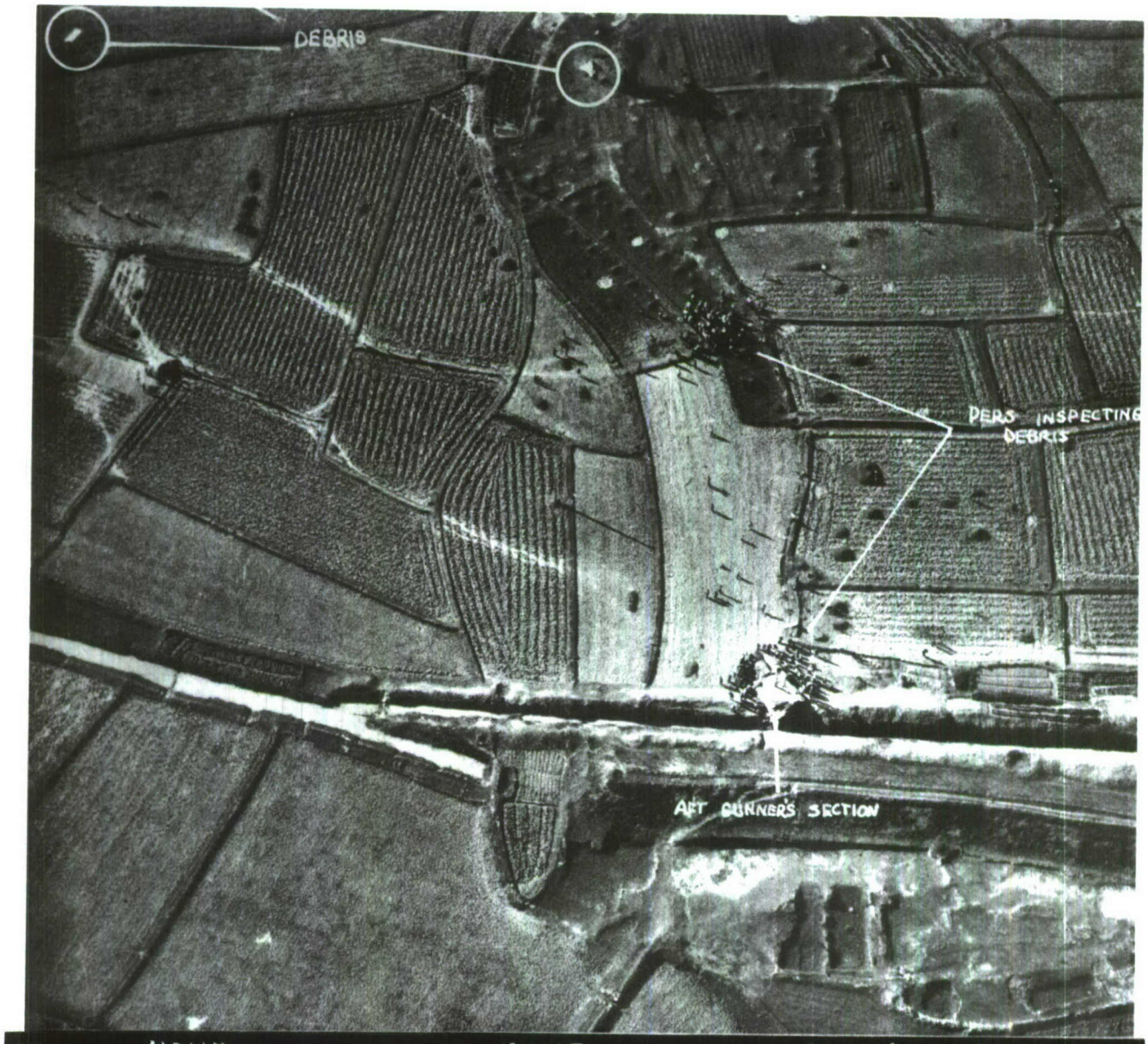

BE NONE TGT NONE GEO 211337N 1Ø542Ø2E
SUBJ B-52 CRASH SITE UTM WJ 74Ø473
LOC 14ØØ METERS SE OF PHUC YEN NEAR RTE 2A
MSN BHQ 22Ø 21 DEC 72 TOT UKN SCALE N/A
FRM 176Ø PAN F415Y F/L 3" XPWR 5 ALT UKN
SIPIA 23162 (1 OF 2) ISSUE DATE 22 DEC 72 PI TIME Ø43ØH 22 DEC 72

B-52 Crash Site

FIGURE 1

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which allowed the DC-130 mother ship to monitor a drone's flight and to make mid-course corrections as necessary.[13] The MCGS provided line-of-sight acquisition, identification, tracking, and control of the drones from launch until recovery. Complete with their navigation systems and cameras, the drones cost about $200,000 each.[14]

Launch, Control, and Recovery

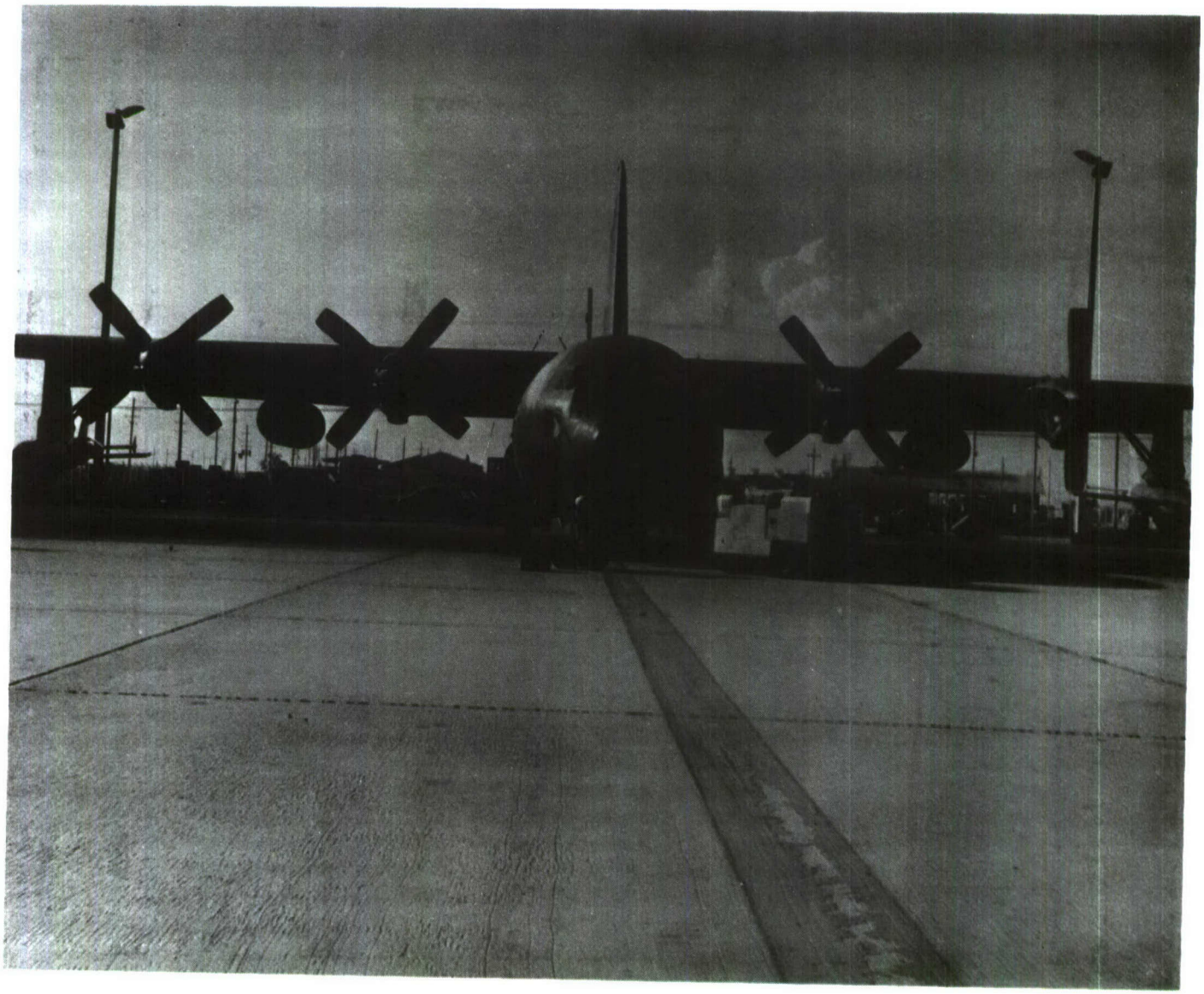
All BUFFALO HUNTER drones were air-launched from DC-130s. These aircraft were modified C-130A/E cargo aircraft specially configured to carry, launch, monitor, and, if need be, control the drones on the reconnaissance missions. Although there were two DC-130s that could carry four drones each, the standard DC-130 carried two drones as shown in Figure 2. In addition to the standard C-130 crew--pilot, copilot, navigator, and flight engineer--the DC-130s were manned by two Launch Control Officers (LCOs), an Airborne Recovery Control Officer (ARCO), and a radar technician who monitored the MCGS. Prior to the DC-130's take-off, the LCOs programmed the drones' internal guidance systems to fly the multi-altitude, multi-heading tracks necessary to reconnoiter the several targets assigned each mission. A typical low-level sortie would attempt from five to 15 targets along a twisting track consisting of numerous headings and altitude changes designed to cover the targets and to deceive the enemy. The low-level scoring (camera on) profile covered about 160 NM (although not all with 60 percent frame overlap), after which the drone climbed rapidly to about 45,000 feet, then rose gradually to about 52,000 feet at the recovery area. A low drone's flight, typically 55 minutes in length, covered 430 NM.

High altitude drones initially climbed steeply to their operating altitudes and then cruise climbed throughout their target tracks to about 74,000 feet. Some had the capability to remain aloft for about five hours.[15]

The BUFFALO HUNTER launch areas depended on the planned targets and tracks. Navy fighter aircraft protected the DC-130 from MIGs when the mission took the DC-130 farther north than 18°30'N over the Gulf of Tonkin. Normally, 7AF provided a flight of four F-4s to protect the DC-130 above 19°N over the high threat, North Vietnam border areas of Laos. (The fighter protection was not always exclusively for the DC-130.)[16]

Launch altitudes were commonly 2,000 feet for the low altitude drones and 20,000 feet for the high drones, but these varied with the weather. Through the MCGS, the ARCO controlled each drone from launch until climb-out by commanding any maneuvers the LCOs had entered into the drone's programmer, i.e., all dives, banks, rates of climb, and headings used for the planned track, plus three additional "remote" commands. Common remote commands were two headings and a rate of climb.[17]

The ARCO essentially played the role of a pilot flying on instruments, but without the advantage of experiencing the actual maneuvers of the drone. Thus if monitoring circuits gave spurious signals, the ARCO sometimes reacted to them with unfortunate consequences. For example, in one case the telemetry indicated that the drone was in a nose-down pitch at 500 feet. The ARCO reacted by pulling the drone up and climbing it to 4,000 feet directly into a SAM envelope--and a SAM got it. In reality, nothing had been wrong with the drone, which was probably flying straight and level at 500 feet,



DC-130 With Two Drones

FIGURE 2

but the ARCO was getting erroneous telemetry. Had the drone actually been at 500 feet in a nose-down attitude, it would have hit the ground within seconds, before the ARCO could have saved it.[18]

Of course, other situations were not so easily diagnosed, even in retrospect. On low altitude sorties, the terrain frequently caused erratic MCGS signals. During such phases the ARCO took no action unless he was sure the drone was malfunctioning. When the telemetry connection failed completely, the drone would usually show up on schedule at the recovery area; sometimes, however, its fate was unknown.[19]

As a rule, the ARCO did not give MCGS commands except to prevent loss of the drone or to correct excessive course deviations. An excessive deviation was seven miles for high altitude missions and two to five miles for low missions, depending upon the scale of the plotting chart used. The chart provided the ARCO with a visual display of the respective positions of the drone and the DC-130. Since the planned track was plotted previously on the same map, the ARCO could determine when the drone deviated off course; that is, he could if he had good telemetry from the drone. Even with the best telemetry, though, the ARCO could never know the drone's position exactly. The trace on his map showed the drone's position relative to the DC-130, and the latter's position was at best accurate only to within 500 yards.[20] Such navigational limitations combined with the narrow swath width of the photography help explain why the low drone frequently missed planned reconnaissance targets.

At the end of its scoring profile, the drone automatically began its climb-out. The ARCO passed the MCGS control to the Drone Recovery Officer (DRO), located on the ground near the recovery area, when the drone was 75 NM to 150 NM from the area. The DRO transmitted course corrections required to bring the drone to the recovery point. Upon the DRO's command, the drone's engine shut down and a drag chute deployed. At 15,000 feet, an engagement chute deployed and was followed by the main chute; the two chutes were separated by a 225-foot load line. At about 10,000 feet, a CH-3 helicopter equipped for mid-air recovery snagged the engagement chute, winched in the load line, and ferried the drone to the recovery airstrip. Mid-air retrieval was preferable, but ground and water recoveries were not uncommon. Even in these cases helicopters were the primary recovery vehicles, occasionally assisted by naval craft for some water recoveries.[21]

The mid-air retrieval system (MARS) was effective. CH-3 operations personnel claimed that, historically, the CH-3s using MARS recovered 97.3 percent of the drones they engaged.[22] Indeed, in 1970 about 98 percent of <u>all</u> returning drones were successfully recovered with MARS. The 1971 data were not available, but the 1972 data available in December 1972 showed that through November the CH-3s using MARS had successfully retrieved 347 of 382 returning drones. Of the remaining 35 returning drones, 28 were surface recoveries, not engaged in mid-air by the CH-3s. The other seven returning drones were not recovered. However, of those drones some were never engaged in mid-air because the parachutes failed to deploy or deployed over hostile territory. When MARS

retrieval failed after engagement, parachute tear-through was the primary cause of such failure.[23]

After a drone was successfully retrieved, ground crews removed the exposed reconnaissance film and packaged it for airlift within two hours to Tan Son Nhut AB, South Vietnam, via one of 7AF's Scatback T-39 couriers. There, the 12th Reconnaissance Intelligence Technical Squadron (12th RITS) developed and interpreted the film for the Commander, 7AF.[24] The 12th RITS also forwarded the film to other national agencies for specialized interpretations. Meanwhile, the DC-130 mother ship picked up the drone and returned it to the home base.

Units of SAC's 350th Strategic Reconnaissance Squadron (SRS) from Davis-Monthan AFB, Arizona, were responsible for launch, control, and recovery of the BUFFALO HUNTER drones. Until 10 July 1970, the DC-130s operated out of Bien Hoa AB, South Vietnam, and the CH-3s out of Da Nang AB, South Vietnam, where the drones were recovered. In July, the DC-130s and launch operations moved to U-Tapao Airfield, Thailand, on temporary duty (TDY) with the 99th SRS. Recovery oprations remained at Da Nang until November 1972, when they moved to Nakhon Phanom Royal Thai Air Force Base (RTAFB), Thailand.[25]

Although the SEA-based 99th SRS and TDY crews from the 350th SRS were responsible for actually conducting the drone missions, the targeting and track planning, i.e., mission planning, in response to SEA intelligence requirements were centralized at SAC's Strategic Reconnaissance Center (SRC), Offutt AFB, Nebraska.[26]

CHAPTER II

MISSION PLANNING

The Strategic Air Command's BUFFALO HUNTER mission was to conduct drone photographic reconnaissance of military targets in SEA, primarily in North Vietnam.[27] Although SAC controlled mission scheduling and specific tasking, the drones were national assets assigned to the Joint Chiefs of Staff (JCS) and controlled by them in support of the overall national reconnaissance requirements levied by the United States Intelligence Board. The JCS delegated their control of drone targeting to SAC, whose Strategic Reconnaissance Center allocated the BUFFALO HUNTER resources against the SEA photo reconnaissance needs of all the intelligence consumers.[28] COMUSMACV and the Commander, 7AF, were heavy consumers of the BUFFALO HUNTER product.

Targeting: Procedures and Problems

The Commander-in-Chief, Pacific Command, was the validation authority for all BUFFALO HUNTER targets nominated by the SEA military commanders and by CINCPAC Component Commands. The Defense Intelligence Agency (DIA) in turn validated CINCPAC requirements and those submitted by national agencies. The original BUFFALO HUNTER target nomination procedures required the 7AF Deputy Chief of Staff/Intelligence to submit 7AF's BUFFALO HUNTER objectives to MACV where J-2 (Intelligence) consolidated the 7AF and MACV requirements and transmitted them to CINCPAC. CINCPAC then forwarded the nominations, usually unchanged, to the SRC for tasking. The SRC integrated

the CINCPAC targets with those arriving through DIA and, considering priorities, locations, and groupings of targets, frequency of coverage, weather, enemy defenses, etc., planned the drone sorties with an eye toward satisfying the maximum number of high priority requests with the available drone assets.[29]

Before the close of 1970, 7AF and MACV found the JCS-established targeting procedures unsatisfactory. Seventh Air Force wanted more direct control of BUFFALO HUNTER missions so it could effect an optimum blend of drone capabilities with TAC Recce and make the 7AF reconnaissance effort more responsive to 7AF/MACV needs--in particular, the urgent requirements to reconnoiter SAM, radar, and anti-aircraft artillery (AAA) which posed a threat to U.S. air operations, including TAC Recce. Seventh Air Force and MACV had decided that the time required to have requests validated through CINCPAC and then consolidated with other national requirements at the SRC made BUFFALO HUNTER unwieldy for high priority, time-sensitive targets such as suspected SAM/AAA sites and MIG locations. An example cited by 7AF concerned a suspected MIG-21 on Vinh Airfield in the panhandle of North Vietnam. Although 7AF had first requested BUFFALO HUNTER coverage of the airfield on 6 December 1970 to confirm or deny the presence of the MIG, the drones had not been successful as late as 15 December. In the meantime 7AF was tying up critical fighter resources to protect B-52s on ARC LIGHT strikes within range of the MIG-21. On one hand, 7AF claimed that such problems would be precluded if MACV/7AF directly controlled a portion of the monthly BUFFALO HUNTER sorties. Furthermore, 7AF concurred

in a Pacific Air Forces suggestion for a SAC/7AF planning team at 7AF to develop mission tracks focusing on 7AF requirements.[30] On the other hand, SAC maintained that the mixing of all national reconnaissance assets (drone, U-2, and SR-71) into an efficient, responsive effort required dedicated single-point management that could best be provided through the expertise of the many specialists in the SRC. SAC contended that the only source of delay in the existing request procedure was that required for electrical message transmission and that adverse weather had been solely responsible for the drones' recent failures to cover the North Vietnam panhandle.[31] (Weather was probably the reason TAC Recce had not covered Vinh Airfield.)

CINCPAC agreed with SAC and, emphasizing the MACV/7AF reliance on national reconnaissance assets because of the high risk for manned aircraft over certain areas of North Vietnam, proposed a targeting system that would not impinge on SAC tasking but would reduce the response time for high priority, time-sensitive requirements. MACV would transmit requests to CINCPAC, SRC, and DIA simultaneously. The SRC would assume CINCPAC and DIA concurrence unless amplifying or contrary instructions were received by telephone and followed by message. In addition, 7AF and MACV would be permitted to request BUFFALO HUNTER tracks by track number from the SRC's library of about 109 multi-target tracks already prepared and available for the southern panhandle of North Vietnam. When MACV/7AF required new tracks, MACV would submit the proposed single mission objectives to CINCPAC for review and approval. CINCPAC would then forward the requirements to the SRC for preparation of the tracks.[32]

These new procedures were implemented in January 1971 following JCS approval. The SRC's normal scheduling cycle required that requests for BUFFALO HUNTER coverage be at the SRC 36 hours prior to the desired time over target. Urgent requests for coverage of high priority objectives had to be available to the mission planners no later than six hours prior to take-off to provide time for the DC-130 crews to reprogram the drone for the new route. Interestingly, it was easier to change a complete mission than to change a target or heading after the drone was programmed.

Following their implementation, the new procedures seemed to be working satisfactorily. In April 1971, General Lucius D. Clay, Jr., then Commander of 7AF, expressed appreciation for the SRC's prompt response to 7AF's request for low altitude reconnaissance in southern Laos.[33] General Creighton W. Abrams, COMUSMACV, added his praise in September 1971 when he described the BUFFALO HUNTER response in support of PRIZE BULL* as outstanding.[34]

Throughout 1971, the North Vietnamese were amassing men and supplies in and above the Demilitarized Zone in preparation for their 1972 Nguyen Hue Offensive against South Vietnam. Of added concern to General John D. Lavelle, Commander of 7AF in the fall of 1971, was the increase in the enemy air defense activity in Route Package 1.** The appearance of MIGs, SAMs, and AAA presented a serious threat to 7AF RF-4C TAC Recce aircraft operating over Route Package 1, eastern Laos, and northern South Vietnam.

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*PRIZE BULL--a preplanned protective reaction air interdiction operation against the enemy's military build-up in North Vietnam just above the Demilitarized Zone.

**Route Package 1 includes most of that area of North Vietnam below 18°N.

To counter both the enemy logistic build-up and the air defense threat, the JCS authorized several special air strikes into Route Package 1 during 1971.[35] The attendant requirements for (1) photo reconnaissance to locate the targets and (2) bomb damage assessment (BDA) after the strikes forced 7AF to rely more and more on BUFFALO HUNTER. These considerations were further complicated toward the end of the year by the Northeast Monsoon with its low ceilings.[36]

At the beginning of August 1971, in an effort to avoid duplicating coverage and to more efficiently coordinate their complementary capabilities 7AF and SAC initiated a procedure to advise each other of their planned reconnaissance missions.[37] The arrangement apparently worked to both parties' satisfaction. After a study of SAC support to 7AF for photo reconnaissance of certain key objectives in Route Package 1 from 1 August to 26 September 1971, a 7AF reconnaissance operations staff officer concluded that SAC assets (BUFFALO HUNTER and GIANT SCALE) were providing more than adequate support to 7AF. According to the study, SAC was scheduling some 7AF reconnaissance objectives more frequently than 7AF had requested.[38]

Starting in early November, the SRC was attempting to honor both formal and informal requests for BUFFALO HUNTER coverage. Seventh Air Force submitted the informal requests through SAC's Advanced Echelon (SAC ADVON), collocated with 7AF. However, there was a limit to this type of informal support. The SRC explained that there were only two DC-130s at U-Tapao, so the two drones per day sortie rate and last minute changes that 7AF requested could not always be achieved within crew rest requirements.

The SRC had no proven system whereby the drones could cover alternate objectives on days the weather precluded flying the primary planned track.[39]

The Northeast Monsoon weather in November hampered the effectiveness of all photo reconnaissance systems to varying degrees, but the low drone less than others. Consequently, 7AF began to demand more from BUFFALO HUNTER than the SRC believed could be delivered. General Lavelle became dissatisfied and raised the old problem, considered by CINCPAC and the Commander-in-Chief, Strategic Air Command (CINCSAC) as solved earlier in the year, of the lack of responsiveness of BUFFALO HUNTER to 7AF photo reconnaissance requirements. In a 28 November 1971 message to General Abrams, he emphasized that the "dynamic movement of SAMs and MIGs throughout North Vietnam dictates immediate responsiveness by a reconnaissance platform" and that the "vehicle most effective under Northeast Monsoonal conditions is the BUFFALO HUNTER drone." He described the target request procedures as "cumbersome, time consuming, and insufficiently responsive to urgent [7AF] requirements to develop or revise BUFFALO HUNTER missions in response to changing threat and weather conditions." He wanted an alternate route prepared for each primary route, and he wanted to communicate more directly with the SRC through SAC ADVON.[40]

After consulting CINCPAC and CINCSAC, General Abrams concluded that the interests of 7AF and all other users of BUFFALO HUNTER-derived intelligence continued to be best served by the SRC's centralized management. (Since time was inevitably lost in changing missions and reprogramming the drones, CINCPAC had advised General Abrams that timely requests for BUFFALO HUNTER coverage would help insure maximum responsiveness.) The system would remain unchanged.[41]

The controversy regarding the responsiveness of BUFFALO HUNTER targeting to the needs of 7AF commanders continued through 1972. General Lavelle noted again in January 1972 that he was not satisfied with the drones' BDA coverage of targets struck during Operation PROUD DEEP ALPHA at the end of December 1971.[42] General John W. Vogt, Jr., who commanded 7AF through the intensive 1972 bombing campaigns against North Vietnam, stated that "the BUFFALO HUNTER program has not been entirely responsive to the tactical air commander."[43]

Even if the drone were exclusively for the use of the tactical commander, however, there were still "limits of flexibility inherent in the BUFFALO HUNTER system," as CINCPAC had pointed out.[44] For instance, one limitation stemmed from the necessity for careful track planning.

Track Planning: Factors and Problems

Once the reconnaissance targets were determined, the SRC planned the tracks using the following considerations: target locations, terrain, drone flight capabilities, photographic requirements, weather, and enemy defenses. Each mission was planned in its entirety even though the track might have been flown before.[45] Ideally, a low drone should pass directly over each target in straight and level flight at 500 to 1,500 feet and at a speed to provide 50 to 60 percent overlap of consecutive film frames. The overlap allowed the 12th RITS photo interpreters to view targets using consecutive frames and stereoscopic optics. Fifty to 60 percent overlap was optimum but 30 percent was acceptable. When straight and level flight over the target was impossible because of terrain features, the track planners programmed

the drone to cross the target at the desired altitude, but during climb or descent modes.[46] To allow for the 3 percent error in the navigation system, the SRC planned the low drone profiles to clear all terrain within 5 NM of the track by at least 500 feet. At the same time, the planners made use of topographical features to achieve surprise and to reduce the enemy's reaction time.[47]

Weather was a primary consideration for two reasons: (1) the programmed drone altitudes were based on a forecast altimeter setting for the target area, and (2) the desired drone profile was approximately 500 feet below any cloud deck in excess of three-eights coverage. Lieutenant General Glen W. Martin, Vice CINCSAC, pointed out the complexity of the problem in a March 1971 letter to General Clay. Discussing the difficulty of obtaining good low-altitude photo reconnaissance of Route 7 in North Vietnam, General Martin explained,[48]

> High terrain around Route 7 requires an initial drone profile of six thousand feet with a stepped descent reaching two thousand feet on the coastal plain. Ceilings of sixty-five hundred feet in the west, forty-five hundred feet in the central and twenty-five hundred feet in the coastal area are required to insure a reasonable degree of success using the low drone.
>
> The high terrain along the route and low clouds often precludes satisfactory coverage of the western two thirds of Route 7. Under these conditions we normally schedule the eastern one third of Route 7 in conjunction with the Vinh targets. This avoids the long straight in approach to the Vinh SAM envelope when conditions are marginal for photo coverage of the western portion of the route.

General Martin's reference to the SAM envelope points out another factor in drone route planning--the drones' susceptibility to enemy defenses.

The drones were vulnerable to a variety of enemy defenses, i.e., SAMs (which constituted the greatest threat), AAA, MIGs, and even small arms fire. Besides its radar tracking capability for higher altitudes, the SA-2 missile system used an optical device to track the drones at low altitudes. As the radars required 30 to 40 seconds to "lock-on" to their targets and the optical capability depended on human reaction, the SRC track planners could take advantage of topographical features and weather to allow the enemy defenses a minimal reaction time.[49] Operational experience had taught the route planners that a low, fast mission profile increased the drones' survivability against enemy defenses. A BUFFALO HUNTER operations officer with many years of experience in the drone programs estimated that the enemy defenses should have only 10 seconds to identify, acquire, and shoot at a low drone properly programmed to use the terrain as a mask. The weather again played an important role because it determined the nature of the enemy defense threat. If the weather was bad below 2,500 feet, there was no MIG threat, and below 700 feet there was little SAM threat. When a mission profile would place a drone above 700 feet in a SAM envelope, the LCOs programmed the drone to change headings, altitude, or airspeed--or a combination of these--every 40 seconds. On the other hand, if the MIGs came up during clear weather, there was no SAM threat because the enemy would not fire SAMs or AAA near the MIGs. The ARCOs were not permitted to give the drones evasive commands to degrade

SAM or AAA threats, only to evade the MIGs.[50] The sequential BUFFALO HUNTER photographs (Figures 3 and 4) show a near miss by a SAM fired at the drone.

When advised of a MIG threat by RED CROWN (a radar-equipped U.S. Navy destroyer on station in the northern part of the Gulf of Tonkin), by U.S. electronic warfare support aircraft, or by other U.S. aircraft near a drone, the ARCOs put the drone through jinking maneuvers to degrade the threat. These maneuvers combined with the drone's small profile and lack of a smoke trail apparently made it a difficult target for the MIGs. Few drones were downed by MIGs, but that could also have been due to lack of interest: the drones were passive and much less lucrative targets than manned strike aircraft.[51] However, as Major General W. W. Marshall, Vice Commander of 7AF under General Lavelle, pointed out, "If I were the NVAF [North Vietnamese Air Force] I would certainly latch on to drone missions over NVN [North Vietnam] as a perfect training device for my MIG pilots at U.S. expense."[52]

Overall, the drones fared rather well in the enemy air defense environment. Of the 292 drones launched for overflight of North Vietnam in 1970, only nine were confirmed lost due to enemy action--five to SAM, three to MIGs, and one to AAA. An additional five drones were lost to unknown causes, possibly enemy action. In 1971, six drones out of 286 launched were lost to the enemy and eight for unknown reasons. Total losses for all reasons (mechanical failure, operational error, guidance system failure, enemy defenses, etc.) were 39 in 1970 and 30 in 1971.[53] The losses attributed to enemy defenses were not available for 1972, but

SA-2 Missile in Flight

FIGURE 3

~~CONFIDENTIAL~~

SA-2 Missile Detonation

FIGURE 4

~~CONFIDENTIAL~~

through November the total lost for all reasons was 44. Of that number, seven returned but were not recovered.[54]

A factor which increased the survivability of the drones over high threat areas was electronic jamming of early warning, surveillance, acquisition, and terminal threat radars by Air Force and Marine electronic countermeasures (ECM) aircraft. The SRC determined which drone tracks required ECM support and requested the support from 7AF. However, the nonavailability of ECM support was not sufficient cause for mission cancellation.[55] In May 1970, EB-66s of the 42d Tactical Electronic Warfare Squadron and EA-6s of the 1st Marine Air Wing were providing about 75 ECM sorties per month in support of 30 BUFFALO HUNTER sorties. Normally, the same ECM sorties were also serving other air operations at the same time, thus the drone missions only received partial ECM support.[56] According to a Headquarters PACAF study, SAC requested ECM support for 198 BUFFALO HUNTER missions during FY 1971, but the support was provided for only 98. Then, two EB-66 aircraft usually provided the support.[57] After a drone loss to a MIG, a 7AF memorandum in January 1972 noted that EB-66 jamming support for the drones was severely curtailed after January 1970 in order to provide support for ARC LIGHT. In fact, there had been no support for the drones since July 1971. An analysis of jamming support for low level drone operations in North Vietnam had shown the following:

> a. Jamming support can degrade specific NVN early warning radars; however, the entire air surveillance network cannot be degraded to the extent that tracking is completely precluded.

b. Positioning of ECM aircraft will increase drone survivability against the SAM threat; however, optimum positioning can usually be realized only on ingress and egress portions of the drone route.

c. For a low altitude drone, ECM support will normally be of little assistance against MIG or AAA threats because ECM effectiveness against Barlock GCI [Ground Controlled Intercept] radar is minimal, and the AAA threat at low altitude is predominately visually controlled.

The memorandum recommended that ARC LIGHT and RF-4 support should take precedence over drone support requirements and that any ECM support for the drones should be limited to areas where the EB-66s would not require fighter escorts.[58] Those recommendations allude to an obvious attribute of drone reconnaissance: commanders can send drones without escort over heavily defended enemy positions where the threat to manned aircraft is inordinately high.

Various causes other than enemy defenses accounted for most drone losses:* guidance system and engine malfunctions accounted for some, some were lost at recovery because the recovery parachute did not deploy properly, or the drone sank before or during water recovery. Many times drones went down for no apparent reason. Such losses were possibly the result of enemy action, but more likely a guidance system malfunction or a mechanical failure was responsible. Some of the confirmed losses occurred following drone malfunctions which rendered the drones vulnerable to enemy defenses.[59]

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*See Table 1, page 32 for total losses.

In one case, the enemy defenses were not the only military threat to the drone. According to one drone operations officer at the 99th SRS, a DRO controlling a drone on its egreee from North Vietnam monitored two U.S. Navy pilots giving a MIG warning. It was a few seconds before he realized from their radio transmissions that the friendly pilots were after his drone. Since he could not transmit directly to the Navy aircraft, he hurriedly radioed the DC-130 mother ship to call the pilots off--but too late. Despite the DRO's efforts to evade them, the Navy aircraft confirmed the drone as a MIG and downed it.[60]

After planning a drone's track, the SRC transmitted the route message to the drone operations personnel in SEA. The LCOs and the ARCO plotted the track on their charts in preparation for the mission and carefully checked the SRC route for any requirements outside the drone's capabilities. This done, they transmitted a track confirmation back to the SRC and programmed the drone for the track. SAC transmitted mission plans to the reconnaissance users and track warnings to combat units operating in the vicinity of the drones. In January 1971, Admiral Bardshar, commander of the Navy's Seventh Fleet task force in the Gulf of Tonkin, queried 7AF concerning the late arrival of track messages. General Clay, then Commander of 7AF, explained that the SRC delayed the message in order to make last-minute target changes in response to changing weather conditions. The messages were arriving usually less than 24 hours in advance of the intended mission although the SRC transmitted them 28 hours in advance. The two commanders found the lead time short for planning their own reconnaissance

and for warning other aircraft out of the area.[61] In this regard some Forward Air Controllers (FACs) operating in areas where BUFFALO HUNTER sorties were employed outside North Vietnam voiced concern that the warnings they received from 7AF's Tactical Air Control Center were not sufficiently definitive as to the drone's times and altitudes. While there had been no reported near misses with the drones, the FACs were concerned about the possibility of a mid-air collision.[62] The closer coordination between the SRC and 7AF later in 1971 apparently solved these problems for no other mention was made of them.

As the SRC track planners gained experience, drone survivability increased. Prior to BUFFALO HUNTER, drones averaged about four sorties before being lost. In 1970, however, they averaged 7.5 sorties and their lifetime increased to 9.5 sorties in 1971, then to 9.6 in 1972.[63] In addition to effecting a reduction in operating costs, the longer lifetimes meant that less intelligence information would be forfeited because of lost drones. This was one step toward improving BUFFALO HUNTER's operational results.

CHAPTER III

OPERATIONAL RESULTS

In the fall of 1971 when General Lavelle was critical of BUFFALO HUNTER's responsiveness to his needs for BDA of interdiction targets in North Vietnam's panhandle, Major General C. M. Talbott, then USAF Director of Operations, requested Air Force intelligence consumers to review their intelligence requirements in order to reduce the number of BUFFALO HUNTER sorties from 25 to 15 per month.[64] In response to General Talbott's request, Major General J. J. Jumper, 7AF Deputy Chief of Staff/Intelligence, emphasized 7AF's reliance on the drone. He pointed out that frequent photo coverage of the Demilitarized Zone and the primary passes from North Vietnam had been impossible for TAC Recce since late November due to unfavorable weather conditions. Only once, on 25 December, were TAC Recce missions successful in Route Package 1.[65] In General Jumper's words,

> Low level BUFFALO HUNTER is the only reconnaissance system in theater that has the unique capability to fly below prevailing cloud cover in safety during the northeast monsoon in NVN, and is responsive to high priority requirements of this headquarters.

General Jumper further stated that BUFFALO HUNTER was "the primary photo resource contributing to the assessment of [the] SAM and air threat to 7AF air operations in this theater." Seventh Air Force's mission could not accept a reduction in drone sorties at that time.[66]

General Jumper's expression of the importance of the BUFFALO HUNTER drones is typical of 7AF Intelligence chiefs and their commanders. General Lavelle's reliance on it has been established. General Vogt's Director of Intelligence, Major General Eugene L. Hudson, discussed the drone

capability after the 1972 bombing campaigns--LINEBACKER I and LINEBACKER II. General Hudson described BUFFALO HUNTER's role as "of the utmost importance to our tactical and strategic reconnaissance objectives." He, as well as General Jumper, was referring to the low drone.[67]

Two attributes of the low altitude drones made them more useful than the high drones for SEA photo reconnaissance. One of these was the better resolution achieved by the low drones. The more important attribute, though, was their ability to work under cloud cover when other photo reconnaissance systems, including the high drones, were essentially useless. The LINEBACKER II bombing campaign against North Vietnam was such a case. That campaign, credited by many political writers and military officers as the stimulus for Hanoi's acceptance of the 28 January 1973 cease-fire, began on 18 December 1972 and ended on 29 December, well into the Northeast Monsoon season in North Vietnam.[68] The poor weather degraded the performance of all photographic reconnaissance systems, including the low drone. However, the low drone was practically the only platform acquiring any usable photography. General Vogt, airpower manager of the LINEBACKER II campaign, described the low drone's contribution.[69]

> BUFFALO HUNTER has played an extremely important part in securing for us the BDA of the strikes in the North. The characteristic that I think makes it invaluable in this role is its ability to go in under the weather during the bad weather periods and procure the necessary coverage. The high altitude airplanes such as the SR-71 and our own tactical reconnaissance, which fly at altitudes considerably higher [than the drone], are not capable of doing this particular job. . . . The BUFFALO HUNTER was extremely valuable to us during the intense combat

> period in December because we were in the middle of the [Northeast] Monsoon season, when cloud conditions were about eight- to ten-tenths at all times. We found ourselves relying increasingly on the HUNTER to get the picture back so we could determine whether or not the target had been destroyed and if we had to go back.

During the reconnaissance effort from 18 December through 29 December, 12 RF-4C tactical reconnaissance sorties provided complete coverage of 49 objectives. During the same time frame 77 BUFFALO HUNTER low altitude drone missions provided complete coverage of 632 objectives. The high altitude drones were not used.[70]

From the beginning of the BUFFALO HUNTER program the low altitude drone was the primary vehicle. Originally the planned sortie rate was approximately 25 per month for the low drones compared to one or two for the high altitude drones.[71] Of course, the high drones' mission was large area coverage rather than the pinpoint close-up coverage of the low drones. A high drone could cover the whole panhandle of North Vietnam in a single mission if the weather was good and the SAMs were preoccupied with strike aircraft.[72] But it was the low drone that was nearly synonymous with BUFFALO HUNTER to the SEA photo intelligence consumers.

The low altitude mission that made the BUFFALO HUNTER operation so valuable also caused certain problems. Because the usable swath was only one to three miles wide, objects farther than one half to one and one-half miles either side of the center of the track were often not interpretable due to extreme obliquity and small scale; and if the drone was not flying in level attitude, the amount of useful photography was even less.[73] Photo

interpreters sometimes had difficulty placing the location of some imagery because the area coverage was insufficient to include nearby landmarks. Further, the drone did not have to be far off its planned track to completely miss its reconnaissance targets. A 12th RITS operations officer summed up the low drones' intelligence product: "BUFFALO HUNTER photography is the best we have--if it is on target."[74]

The low drones were on target about 40 percent of the time. For example, in 1972 the low drones successfully covered 2,543 of the 6,335 high priority targets they attempted. The success rate was 38 percent in 1970 and 40 percent in 1971. The high drones' success rate was poorer--30 percent in 1970 and only 12 percent in 1971--probably because of weather conditions. The high drones were not used for high priority photo reconnaissance targets in 1972. At least for the low drones, the navigation system was the principal cause for the misses, followed by weather. In 1970 when the high drones flew a larger portion of BUFFALO HUNTER missions than in the two succeeding years, weather and navigational causes contributed about equally to target misses.[75] (Table 1 summarizes BUFFALO HUNTER's performance in support of overall national requirements.)

Seventh Air Force reconnaissance targets normally comprised a large share of the national requirements. An informal 7AF analysis of 74 scheduled BUFFALO HUNTER missions from 31 October through 13 December 1970 presented the following observations:

a. Approximately 43 percent of the drones scheduled were flown and recovered successfully.

TABLE 1

BUFFALO HUNTER DRONE OPERATIONS IN SEA
1970-1972

Year	1970	1971	1972
Drones Launched	292	286	498
Low	277	277	494
High	15	9	4
Drones Recovered	253	256	446
Low	238	249	443
High	15	7	3
Drones Lost	39	30	52
Low	39	28	51
High	0	2	1
High Priority Targets Attempted	2,178	4,429	6,335
Low Drone	1,756	4,026	6,335
High Drone	422	403	0
High Priority Targets Covered	791	1,669	2,543
Low Drone	664	1,619	2,543
High Drone	127	50	0
Lost Coverage Causes			
Navigation	534	1,166	2,008
Weather	559	824	890
Camera	80	143	216
Lost Drone	214	627	653
Not Reported	---	---	25
Total	1,387	2,760	3,792

SOURCE: Hq SAC/HO working papers, 19 Jan 73.

b. Of scheduled missions, 7AF had primary interest in 73 percent.

c. Of sorties flown and recovered, 7AF had primary interest in 84 percent.

d. Of the planned objectives on a recovered sortie, approximately 23 percent had complete coverage.

e. Approximately 36 percent of the planned objectives on the recovered sorties had some coverage of intelligence value.

Weather conditions were poor during the period considered.[76]

The BUFFALO HUNTER sortie rate began at about 25 per month in February 1970 and remained at that rate until 1972 when it began to average about 40 sorties per month. In December 1972, the DC-130 crews launched a record 78 drones in support of the U.S. reconnaissance effort just prior to LINEBACKER II and then in support of that campaign. The old monthly record of 47 launches was already surpassed at Christmas; the two DC-130s had been launching four drones per day for most of the month. After Christmas, a third DC-130 participated in drone launch operations.[77] Table 2 presents the sortie rates for 1970 through 1972.

In January 1973, 7AF intelligence personnel analyzed BUFFALO HUNTER's performance in support of LINEBACKER II. Again, the overall success rate was 40 percent; however, the coverage rate for the 7AF/MACV objectives alone was only 25 percent. The percentages of misses attributed to weather (36 percent) and miscellaneous causes (27 percent) were the same for the 7AF/MACV objectives as for the overall program. What the 7AF personnel termed planned track misses, i.e., targets missed because the planned track bypassed them, had reduced the drones' coverage rate of 7AF/MACV targets.[78] Then a question of BUFFALO HUNTER's responsiveness

TABLE 2

BUFFALO HUNTER DRONE LAUNCHES
1970-1972

	MONTH												
YEAR	J	F	M	A	M	J	J	A	S	O	N	D	TOTAL
1970	27	30	27	23	26	25	24	24	17	18	22	29	292
1971	21	24	29	27	22	25	25	20	22	19	28	24	286
1972	43	21	35	36	42	35	40	41	44	47	36	78	498

SOURCE: Hq SAC/HO working papers, 19 Jan 73.

to MACV/7AF requirements within overall national requirements arose. Were MACV/7AF objectives, although scheduled by the SRC as mission objectives, being bypassed for other national requirements?

There were two factors which served to reduce the BUFFALO HUNTER 7AF/MACV objective coverage rate in support of LINEBACKER II. First, the JCS had directed daily coverage of the northeast and northwest rail lines in North Vietnam, as well as near daily coverage of all North Vietnamese ports and anchorages. Because the weather precluded the high altitude SR-71 missions, which usually covered those objectives, the SRC had to use the drone. Those JCS objectives alone required at least two drones per day. In addition, the JCS diverted the drone to cover special targets such as the Bac Mai Hospital. In that instance, two drone missions were wasted because the DIA gave the SRC the wrong street address for the hospital.[79]

The second factor reducing the coverage rate was that the SRC mission planners expanded the target objective list on BUFFALO HUNTER missions to include any high priority targets within approximately 3 NM of the planned track. The SRC intended this solely as an aid to the 12th RITS photo interpreters who had to provide the immediate photo interpretation reports to the 7AF Director of Intelligence. In the event the drone strayed, the interpreter would be alerted to exploit any high priority targets slightly off the planned track. With the expanded target list, the coverage rate was bound to decrease. Apparently, the SRC did not explain the expanded list to 7AF so 7AF intelligence personnel were expecting coverage at the normal 40 percent rate.[80]

General Vogt realized that 7AF had to compete with higher priority national programs for BUFFALO HUNTER support. Because of the bad weather and high threat in the Hanoi area during LINEBACKER II, however, he relied heavily upon the drones for strike planning and BDA intelligence. Many major combat decisions hinged on drone photography. Accordingly, General Vogt desired a drone capability exclusively for the campaign commander.[81]

> We had to compete with higher priority programs directed from the national level on many occasions. This has impaired our capability to properly plan our combat activity for the next 24 hours. Many times I was anxious to know whether or not I had to go back to an important target and was relying on the drone to get the picture for me, only to find that the . . . drone had been diverted by higher priority objectives from Washington or somewhere up the line. I think it is essential that we come up with a drone capability for the tactical commander, under his control, not subject to diversion, if he's to successfully carry on his air campaign with minimum loss of lives and maximum impact on the enemy.

General Vogt's desire to exercise command and control of the drones attests to the vital role they played in SEA.

As the SRC's idea to expand the LINEBACKER II objective list indicates, a straying drone did not result in a completely wasted mission. Many times when drones strayed from their planned track, they brought back photographs of "bonus" targets which provided unexpected intelligence, sometimes on previously unknown enemy activities such as new SAM/AAA sites. While he acknowledged that the drones had covered a great many bonus targets, General Vogt said that they did not compensate for missed planned objectives. The guidance

system and the reliability of the drone system as a whole needed improvement.[82]

Both operators of the drone system and consumers of its intelligence product agreed that the system needed improvement, primarily in navigational accuracy. But even with its limitations, BUFFALO HUNTER proved itself in SEA. Of the three photo reconnaissance systems, it most nearly approached an all-weather capability. Further, to its credit, it was able to operate despite sophisticated enemy air defenses. General Vogt's assessment of the drones' contribution to LINEBACKER II properly casts BUFFALO HUNTER in its vital role:[83]

> I know of no other way we could have obtained the information we needed . . . [during] the intensive combat activity of the December period.

FOOTNOTES

1. Intvw (S), Capt Paul W. Elder, CHECO Historian, with Lt Col John A. Dale, BUFFALO HUNTER Operations Officer, 99th SRS, U-Tapao Afld, 24 Dec 72.

2. Project CHECO Southeast Asia Report (S), USAF Tactical Reconnaissance in Southeast Asia, 23 Nov 71, p. 52.

3. Project CHECO Southeast Asia Report (S), Reconnaissance in SEAsia Jul 1966-Jun 1969, 15 Jul 69, pp. 29, 31; intvw (S), Capt Paul W. Elder, CHECO Historian, with Lt Col John A. Dale, BUFFALO HUNTER Operations Officer, 99th SRS, U-Tapao Afld, 22 Dec 72.

4. Howard Silber, "Drone Spots Bomb Toll," Omaha World Herald, 31 Dec 72, pp. 1, 2.

5. Dale intvw, 22 Dec 72.

6. Intvw (S), Capt Paul W. Elder, CHECO Historian, with MGen Eugene L. Hudson, Dir of Intelligence, 7AF, 26 Jan 73.

7. USMACV Command History 1970, Vol I (S), p. VI-35.

8. USAF Tactical Reconnaissance in Southeast Asia, p. 52; intvw (S), Capt Paul W. Elder, CHECO Historian, with Maj Leslie B. Thompson, Ops Officer, 12th RITS, Tan Son Nhut AB, 18 Dec 72.

9. USAF Standard Aircraft/Missile Characteristics (S), Air Force Guide Number Two, Vol I, Deputy for Engineering, ASD, AFSC, Oct 70.

10. Louis M. Martucci, Major, USAF, "Tactical Drone Reconnaissance and Naval Applications," (S) (Thesis, The United States Naval War College, College of Naval Command and Staff, 19 Jun 72), pp. 12, 13. [Hereinafter cited as Martucci, TDR.]

11. USAF Tactical Reconnaissance in Southeast Asia, p. 53; Dale intvw, 22 Dec 72; rprt (S), SAC Drone Operations, 1 January 1968-30 June 1971, 19 Jan 73, pp. 3, 5; Martucci, TDR, pp. 16, 17.

12. SAC Drone Operations, pp. 2, 3, 6; USAF Tactical Reconnaissance in Southeast Asia, pp. 53, 54; Martucci, TDR, p. 17.

13. Martucci, TDR, p. 16.

14. Hq PACAF rprt (S), Summary Air Operations Southeast Asia, Vol LXXXX, Jan 72, sec 4, p. 5.

15. Personal observation of the author who accompanied a DC-130 crew on a BUFFALO HUNTER mission from U-Tapao Afld, Thailand, 22 Dec 72; SAC Drone Operations, pp. 8, 9.

16. Intvw (S), Capt Paul W. Elder, CHECO Historian, with Major William E. Casey, Jr., USSAG/DOXC, formerly Reconnaissance Plans Officer in MACV/MACDO-233 and BUFFALO HUNTER Project Officer, 1 May 73; SAC OPORD 63-70-01 (TS), Annex A, pp. 5, 6. [The highest classification of material extracted from this document is SECRET. Document located on CHECO microfilm roll (CMR): TS-172.]

17. Dale intvw., 22 Dec 72.

18. Ibid.

19. Ibid.

20. SAC OPORD 63-70-01 Annex A, pp. 19, 21; Dale intvw, 22 Dec 72.

21. USAF Tactical Reconnaissance in Southeast Asia, p. 55; observations of the author, 22 Dec 72.

22. USAF Tactical Reconnaissance in Southeast Asia, p. 55; intvw (U), Capt Paul W. Elder, CHECO Historian, with Major Lynn T. Kelso, 99th SRS (OLNB), NKP RTAFB, 22 Dec 72.

23. 99th SRS mission log.

24. USAF Tactical Reconnaissance in Southeast Asia, p. 57; ltr (U), 7AF/DOPR to 12th RITS, et al, 13 Jan 71 [CMR: S-627].

25. Staff summary sheet (S), 7AF/DOCR, subj: Reconnaissance Activities in SEA, 21 May 70 [CMR: S-433]; Kelso intvw.

26. Intvw (U), Capt Paul W. Elder, CHECO Historian, with Lt Col Edward E. Mutch, Chief, Intelligence Div, SAC ADVON, Tan Son Nhut AB, 16 Dec 72.

27. Ltr (S), CINCPAC to CINCSAC, et al, subj: CINCPAC Operations Security (OPSEC) Survey of BUFFALO HUNTER Operations in Southeast Asia, 24 Sep 71 [CMR: S-548].

28. Staff summary sheet (S), BGen Darrell S. Cramer, 7AF Dir of Combat Ops, subj: Reconnaissance Activities in SEA, 21 May 70 [CMR: S-433]; Mutch intvw.

29. MR (U), Maj Mack C. Turley, 7AF/DOXRR, subj: BUFFALO HUNTER, 28 Sep 71 [CMR: S-547]; staff summary sheet (S), Col Pomeroy, 7AF/DOXR, subj: BUFFALO HUNTER Tasking, 28 Nov 71 [CMR: S-547]; msg (S), CINCPAC to JCS, 312340Z Dec 70 [CMR: S-603]; Mutch intvw.

30. Msg (S), AFSSO 7AF to SSO MACV/J211, 230820Z Nov 70 [CMR: S-433]; msg (S), AFSSO 7AF to AFSSO USAF, et al, 112112Z Dec 70 [CMR: S-603].

31. Msg (S), SSO SAC to AFSSO USAF, 192050Z Dec 70 [CMR: S-603].

32. Msg (S), CINCPAC to JCS, 312340Z Dec 70 [CMR: S-603]; msg (S), CINCPAC to SACRECONCEN, 132146Z Jan 71 [CMR: S-603].

33. Ltr (S), 7AF/CC to SAC/CV, subj: Reconnaissance of Route 7, 3 Apr 71, cited in msg (S), SAC to 7AF/SAC ADVON, 170026Z Nov 71 [CMR: S-603].

34. Msg (S), COMUSMACV to CINCPAC, et al, 241001Z Sep 71 [CMR: S-627].

35. Project CHECO Southeast Asia Report (TS), Rules of Engagement November 1969-September 1972, 1 Mar 73, pp. 32-37.

36. Msg (S), AFSSO 7AF to AFSSO USAF, 290922Z Dec 71 [CMR: S-603].

37. Msg (S), 7AF to SRC, 040655Z Aug 71 [CMR: S-547].

38. MR (S), Maj Cortlandt M. Taylor, Reconnaissance Operations Staff Officer, subj: SAC's Contribution to Route Pack One (RP-1) Coverage, 3 Oct 71 [CMR: S-547].

39. Msg (S), SAC to 7AF/SAC ADVON, 170026Z Nov 71 [CMR: S-603].

40. Msg (S), 7AF to COMUSMACV, 280810Z Nov 71 [CMR: S-603].

41. Msg (S), COMUSMACV to 7AF, 061150Z Dec 71 [CMR: S-603].

42. Msg (S), CINCPAC to SACRECONCEN, 311302Z Dec 71 [CMR: S-603]; msg (S), SACRECONCEN to CINCPAC, 311720Z Dec 71 [CMR: S-603]; msg (S), AFSSO 7AF to AFSSO CINCPACAF, [DTG missing] Jan 72 [CMR: TS-124].

43. Intvw (S), Maj William Prout, MACV History Branch, with General John W. Vogt, Jr., Cmdr, 7AF, Hq MACV, 26 Jan 73.

44. Msg (S), COMUSMACV to 7AF, 061150Z Dec 71 [CMR: S-603].

45. MR (U), Maj Mack C. Turley, 7AF/DOXRR, subj: BUFFALO HUNTER, 28 Sep 71 [CMR: S-547].

46. SAC OPORD 63-70-01, Annex A, pp. 15, 16.

47. SAC Drone Operations, p. 9.

48. Ltr (S), Lt Gen Glen W. Martin, VCINC, SAC, to Gen Lucius D. Clay, Jr., Cmdr, 7AF, 25 Mar 71 [CMR: S-547].

49. SAC Drone Operations, p. 12.

50. Dale intvw, 22 Dec 72.

51. Ibid.

52. Memo (U), Maj Gen W. W. Marshall, Vice Cmdr., 7AF, to Maj Gen Alton D. Slay, 7AF/DCS Operations, 21 Jan 72 [CMR: S-763].

53. USAF Tactical Reconnaissance in Southeast Asia, p. 56; SAC Drone Operations, p. 13. [A 24 Jan 72 7AF/Dir Ops Plans memorandum for Maj Gen W. W. Marshall, Vice Cmdr 7AF, put total 1971 BUFFALO HUNTER launches at 325 with five losses to SAMs and six to unknown causes. None were lost to AAA or MIGs. CMR: S-763].

54. 99th SRS mission log.

55. SAC OPORD 63-70-01, Annex A, p. 6.

56. Staff summary sheet, Reconnaissance Activities in SEA. [7AF/DOPR historical documentation put the average monthly sortie rate at 85 for 1 Jan-31 May 70. CMR: S-433].

57. PACAF Summary Air Operations, sec 4, p. 4.

58. Memo (S), DCS/Ops to Vice Cmdr/7AF, subj: Action Items From Visits By General Clay And General Momyer, 24 Jan 72 [CMR: S-763].

59. Dale intvw, 22 Dec 72.

60. Dale intvw, 24 Dec 72.

61. Msg (S), 7AF to CTF 77, 210200Z Jan 71 [CMR: S-547].

62. Minutes (S), SEA FAC Conference, Ubon RTAFB, Thailand, 12 Oct 71 [CMR: S-557].

63. SAC Drone Operations, p. 13; working papers (S), "Drone Operations SEAsia 1968-1972," Hq SAC/HO, 19 Jan 73.

64. Msg (S), AFSSO USAF to AFSSO PACAF, 202220Z Dec 71 [CMR: S-603].

65. Msg (S), AFSSO 7AF to AFSSO USAF, 290922Z Dec 71 [CMR: S-603].

66. Ibid.

67. Gen Vogt intvw; MGen Hudson intvw.

68. Evans and Novak, "The Bombing and Thieu's 'Chance,'" Stars and Stripes (Pacific Ed), 28 Jan 73, p. 10; Joseph Alsop, "Behind the Scenes of Peace Talks," Stars and Stripes (Pacific Ed), 31 Jan 73, p. 10.

69. Gen Vogt intvw.

70. Summary (C), "Reconnaissance Mission Objectives," 12th RITS, undtd.

71. SAC OPORD 63-70-01, Basic Order, p. 1.

72. Dale intvw, 22 Dec 72.

73. Intvw (S), Capt Paul W. Elder, CHECO Historian, with Maj Louis M. Martucci, Chief, Exploitation Branch, 12th RITS, Tan Son Nhut AB, 27 Dec 72.

74. Thompson intvw.

75. Working papers, "Drone Operations SEAsia 1968-1972."

76. BUFFALO HUNTER Analysis (S), 7AF, 31 Jan 71 [CMR: S-433].

77. Dale intvw, 24 Dec 72.

78. Briefing chart (S), MACV/MACDI, Jan 73.

79. Intvw (U), Capt Paul W. Elder, CHECO Historian, with Maj Phillip M. Morris, SAC ADVON, NKP RTAFB, 1 May 73. [Maj Morris worked in SRC/INR during LINEBACKER II and participated in drone track planning.]

80. Ibid.

81. General Vogt intvw.

82. Ibid.

83. Ibid.

GLOSSARY

AAA	Anti-aircraft Artillery
ARC LIGHT	(S) B-52 operations in SEA
ARCO	Airborne Recovery Control Officer
ATOL	U.S. nickname for Soviet heat-seeking air-to-air missile.
BDA	Bomb Damage Assessment
CINCPAC	Commander-in-Chief, Pacific Command
CINCSAC	Commander-in-Chief, Strategic Air Command
COMUSMACV	Commander, U.S. Military Assistance Command, Vietnam
DIA	Defense Intelligence Agency
DMZ	Demilitarized Zone
DRO	Drone Recovery Officer
ECM	Electronic Countermeasures
FAC	Forward Air Controller
Fansong	U.S. nickname identifying enemy ground radars used for guidance of SA-2 surface-to-air missiles.
GCI	Ground Controlled Intercept
JCS	Joint Chiefs of Staff
LCO	Launch Control Officer
MACV	Military Assistance Command, Vietnam
MARS	Mid-Air Retrieval System
MCGS	Microwave Command Guidance System
MIG	Soviet-built jet fighter aircraft
NM	Nautical Mile
NVAF	North Vietnamese Air Force
NVN	North Vietnam
PACAF	Pacific Air Forces
RITS	Reconnaissance Intelligence Technical Squadron
RTAFB	Royal Thai Air Force Base

SAC	Strategic Air Command
SAC ADVON	SAC's Advanced Echelon at 7AF/MACV
SAM	Surface-to-Air Missile
Scatback	A nickname for 7AF non-combat flight operations out of Tan Son Nhut AB.
SEA	Southeast Asia
SPA	Special Purpose Aircraft
SRC	Strategic Reconnaissance Center
SRS	Strategic Reconnaissance Squadron
TAC Recce	Tactical reconnaissance
TDY	Temporary duty

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REPLY TO ATTN OF XOAD

24 May 1974

SUBJECT Errata Sheet, Project CHECO SEA Report, "BUFFALO HUNTER, 1970-1972"

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Request that the following pen-and-ink correction be made in your copy(ies) of subject report:

Page 2, line 23, change "AGM-34L" to "AQM-34L"

V.H. Gallacher

V. H. GALLACHER, Lt Colonel, USAF
Chief, CHECO/CORONA HARVEST Division
Ops Anal, DCS/Plans and Operations

Sgt Hueth
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